Section I

State whether the following statements are True or False (1 Mark Each)

(i) The bi conditional statement $p \leftrightarrow q$ is false when both p and q are false. F

(ii) The value of $1.0+\overline{(0+1)}$ is 0. $0 + (1 \cdot 0) = 0$

(iii) If n is odd integer, then n^2 is odd.

(iv) The seventh term a_6 of the sequence defined by the recurrence relation and initial conditions,

$$a_n = a_{n-1} - a_{n-2} + a_{n-3}\,,\; a_0 = 1, a_1 = 1, a_2 = 2 \text{ is } 1.$$

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(v) If f1(x) and f2(x) are both O(g(x)). Then (f1+f2)(x) is O(g(x)).

Question	(i)	(ii)	(iii)	(iv)	(v)
Answer	False	True	True	False	True

Section II

From the following choose the correct answer (1 Mark Each)

1. the negation of the statement $\sim p \rightarrow q$ is:

(a) $p \wedge q$ (b) $p \wedge \sim q$ (c) $\sim p \wedge \sim q$ (d) $\sim p \wedge q$

~~$\neg(\neg p \rightarrow q)$~~

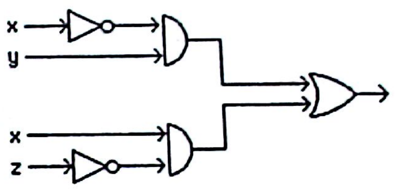
$p \rightarrow \neg q$

p	¬p	q	¬q	¬p→q
T	F	T	F	T
T	F	F	T	T
F	T	T	F	T
F	T	F	T	F

2. Derive the Boolean expression for the logic circuit shown below:

$\neg x y$

$x \bar{z}$



(a) $\bar{x}y + xz$ (b) $\boxed{\bar{x}y + x\bar{z}}$ (c) $x\bar{y} + xz$ (d) None of above

3. Universal quantifier is denoted by

(a)∀ (b)μ (c)∃ (d)None

$\neg p \wedge q$: F, F, T, F

$p \wedge q$: T, F, F,

$p \wedge \neg q$: F, T, F,

$\neg p \wedge \neg q$: F, F, F,

4. Let A be a 3 × 4 matrix, B be a 4 × 5 matrix, and C be a 4 × 4 matrix. Determine which of the following products is not defined ?

(a)AB (b) AC (c) CA (d) CB.

5. which of these functions is not $O(x^2)$.

(a) $f(x)=17x+11$ (b)$f(x)=x^2+1000$ (c) $f(x)= x\log x$ (d)$f(x)=x^4/2$

6. convert $(204)_{10}$ to base 2 .

(a)10001000 (b)11001100 (c)00001111 (d)00000000

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7. The prime factorization of 56 is

(a)$2^3.7$ (b) $2^2.7$ (c)$7^3.2$ (d)None

Question	1	2	3	4	5	6	7
Answer	d	b	a	c	d	b	a

Section III

Attempt all questions (3 Marks Each)

1. Build a digital circuit that produces the output $(p \vee \neg r) \wedge (\neg p \vee (q \vee \neg r))$ when given input bits p, q, and r.

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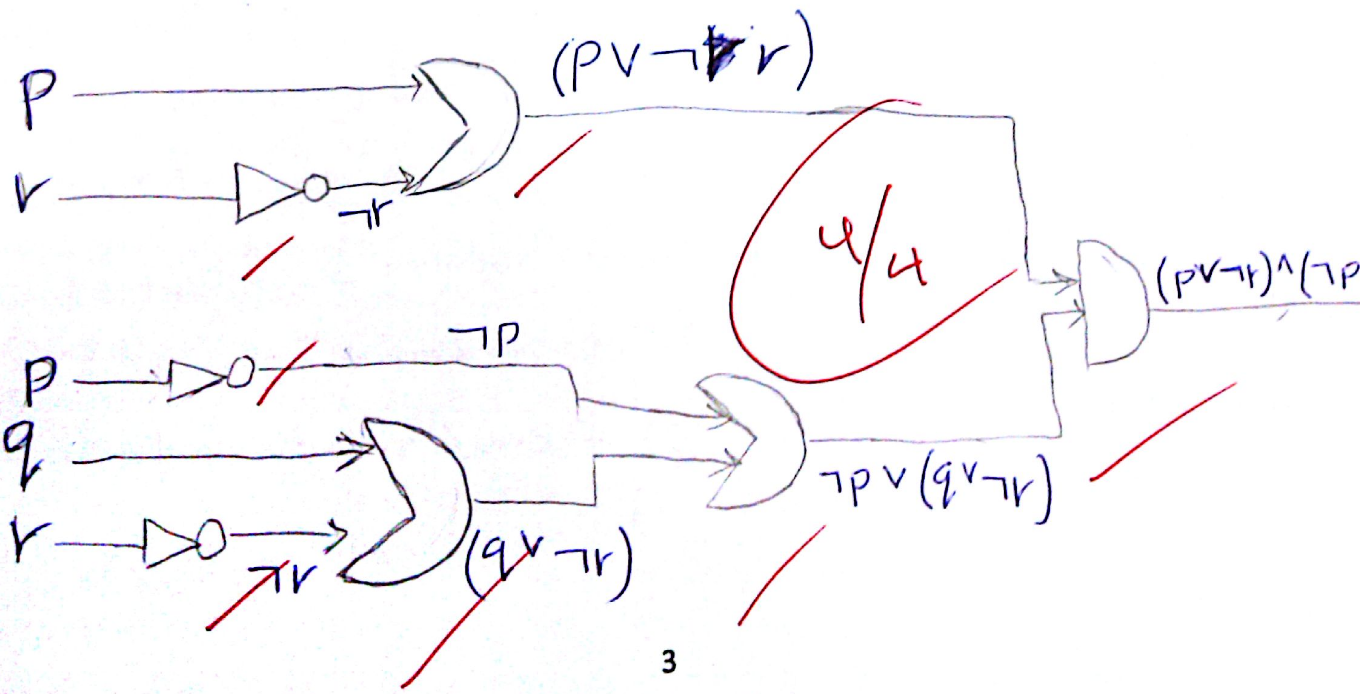
Solutions:



2. Let $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$. Find

(a) $A \vee B$ (b) $A \odot B$.

a): $A+B = A \vee B$

$= \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

$= \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$

b: $A \times B = A \odot B$

$= \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

$= \begin{bmatrix} 0+1 & 1+0 \\ 0+1 & 0+0 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$

3. List all the steps used to search for 7 in the sequence 1,3, 4, 5, 6, 8, 9, 11 for both a linear search and a binary search.

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* linear Search

1- for searching for 7 in sequence of number take (7) and comber it to the first number (or the numbers)

2- If the first number wasn't equal to (7) it compar it to the next number... etc *or the number given*

3- the number (7) was conderd and no mach was fond

4- display resoult null or was not found.

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* binary search

1- take the set of numbers and diried it to two group

2- Comber the number (7 in this case) to the first number and the last number of each group and Idintifay the first and last ... he then can desaid wich groub to s

... the numbers he then

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4. (a) Use the Euclidean algorithm to find gcd(34, 21).

(b)what is the decimal expansion of the integer that (101011111)$_2$ as its binary expansion

a) gcd(34, 21) is

$34 = 21 \cdot 1 + 13$

$21 = 13 \cdot 1 + 8$

$13 = 8 \cdot 1 + 5$

$8 = 5 \cdot 1 + 3$

$5 = 3 \cdot 1 + 2$ This is the gcd

$3 = 2 \cdot 1 + 1$

$2 = 2 \cdot 1 + 0$

$\gcd(34, 21) = 1$

3/3

$101011111 = 2^8 \times 1 + 2^7 \times 0 + 2^6 \times 1 + 2^5 \times 0 + 2^4 \times 1 +$

$2^3 \times 1 + 2^2 \times 1 + 2^1 \times 1 + 2^0 \times 1$

$256 + 0 + 64 + 0 + 16 + 8 + 4 + 2 + 1 =$

so $(101011111)_2 = (351)_{10}$

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